

Manual Part No. 2237397-0001  
Cover Part No. 2243307-0001

# ROM Upgrade



TEXAS  
INSTRUMENTS



Texas Instruments Professional Computer

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ROM Upgrade  
TI Part No. 2237397-0001  
Original Issue: March 1984

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## Preface

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This manual provides the user or technician with information necessary to install and use the Read-Only Memory (ROM) upgrade option. After the option has been installed, file this manual in your *Operating Instructions*.

This manual is divided into five chapters.

Chapter 1 describes the ROM upgrade option, lists the tools required for installation and removal, and provides a checklist to use in case of difficulties.

Chapter 2 contains step-by-step instructions for installing the ROM upgrade option. An installation checklist appears at the end of the chapter for quick reference.

Chapter 3 discusses the procedures for removing the ROM upgrade option.

Chapter 4 describes what ROM is and what a ROM upgrade will do.

Chapter 5 provides troubleshooting information for the ROM upgrade. This chapter also includes error messages that you may encounter and corrective action you can take.

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## **Introduction**

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This chapter describes the read-only memory (ROM) upgrade option, provides part numbers for the option kit and kit components, and shows the tools needed to install the option.

### **PURPOSE**

The ROM upgrade kit allows you to update the firmware in the Texas Instruments Professional Computer system ROMs to the latest revision. Occasionally, Texas Instruments introduces new options that require firmware changes. This option allows users to upgrade their system conveniently. Note that the individual option kits will specify whether or not you need to have this kit.

### **DESCRIPTION**

Each option kit contains a ROM device(s), an option manual, and an anti-static plastic bag. The ROM device can be in the form of either one 8K byte ROM device or two 4K byte ROM devices.

TI Part Numbers for the ROM upgrade kits are:

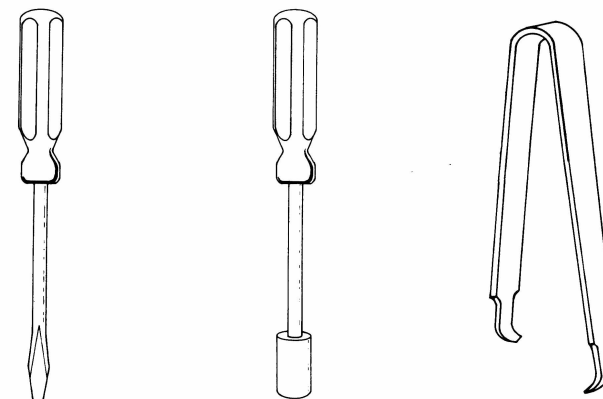
TI Part No.	Description
2237396-0001	ROM Option Kit, System Upgrade
consisting of:	
2223031-0005	System ROM, 4K byte capacity
2223031-0006	System ROM, 4K byte capacity
2237397-0001	Option Manual, ROM Upgrade
2211752-0001	Plastic Bag, Antistatic
or	
2223064-0005	System ROM, 8K byte capacity
2237397-0001	Option Manual, ROM Upgrade
2211752-0001	Plastic Bag, Antistatic

#### NOTE

The part number and ROM version number may change with each new revision. A label affixed to the front cover of this manual tells the precise version number and part number of this kit.

## TOOL REQUIREMENTS

The following tools are needed to install the ROM upgrade option.



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- Medium-size flat-bladed screwdriver
- 1/4-in nutdriver (optional tool for installing option board retaining screw)
- An integrated circuit (IC) removal tool or a small flat-bladed screwdriver (useful for removing individual ROM devices from the system unit board)

## IN CASE YOU HAVE PROBLEMS . . .

If you have any operating difficulties after installing the option, check for the following conditions:

- Improper seating of the option ROM(s) in the socket(s)
- Loose connectors, or improper cable hookup
- Another option that you may have loosened from its socket

## Installation

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### PRELIMINARY STEPS

Before installing this option, complete the procedures described in the following sections of this chapter.

- System unit preparation
- Option boards removal
- System unit board removal

### System Unit Preparation

Follow this procedure to open the system unit.

#### NOTE

If your computer is a Texas Instruments Portable Professional Computer, refer to the Texas Instruments Portable Professional Computer operating instructions (TI Part No. 2238689-0001) for system unit disassembly and option board removal instructions.

1. Be sure you have sufficient working space. You will turn the system unit to gain access to the back panel, and you need space beside the system unit (with the cover removed) to place the display unit temporarily for installation checkout.
2. Follow these steps to make certain your Texas Instruments Professional Computer is operational.
  - Insert a diagnostics diskette in the left drive and close the door.

- Place the system unit ON/OFF switch in the ON position. (The self-test executes and the diagnostics menu appears on the display.)
- Select the Overall Unit Test and follow the procedures outlined in the *Texas Instruments Professional Computer Operating Instructions*.
- During this test, the system configuration table appears on the display.

The following statement:

ROMs installed:  
V1.23 SYSROM

indicates the revision label of the ROM(s) installed in your professional computer. Compare the version number on the label to the version number supplied by the diagnostics.

#### NOTE

If the version number on the label is less than or equal to the version number supplied by the diagnostics, then you have a more recent ROM version. *There is no reason to change ROM(s).* Otherwise, continue with the Installation Procedure.

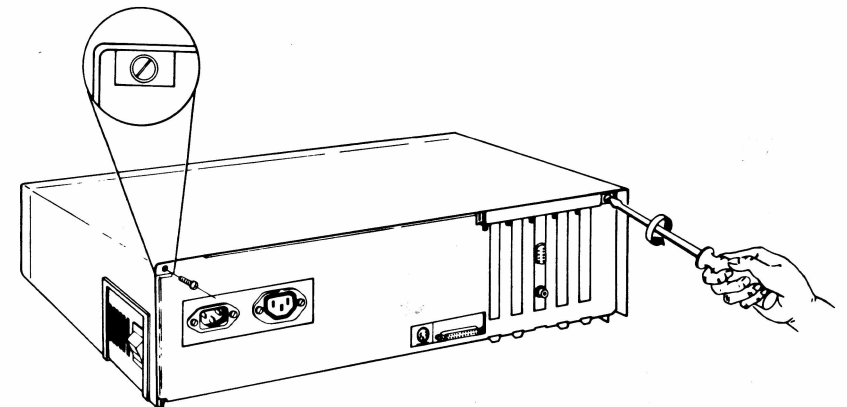
3. Place the system unit ON/OFF switch in the OFF position, and remove the system unit power cord from the ac receptacle.
4. Disconnect the following:
  - System unit power cord
  - Display unit power cord
  - Display unit signal cable

- Keyboard cable
  - Any peripheral cables connected to the system unit
5. Remove the display unit from the top of the system unit and set it to the side. Set the keyboard and any additional equipment to the side, away from the system unit.

#### CAUTION

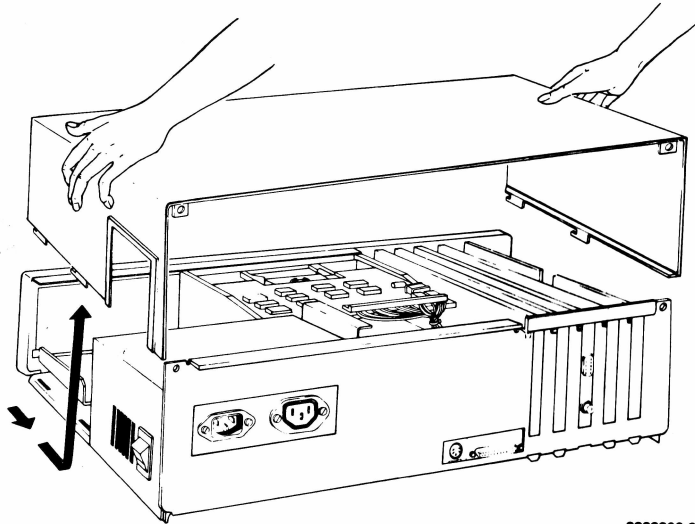
Static electricity can be destructive to static-sensitive components mounted on the system unit board. Before you touch any of the printed wiring boards be sure you are discharged of static electricity. Do this by momentarily touching any grounded object or a metal-framed desk or table.

6. Turn the system unit so that the back panel is facing you. Remove one screw from each top corner using a flat-bladed screwdriver. Refer to the following illustration for the locations of these screws.



2223206-2

7. Remove the system unit cover by pulling it back approximately 13 mm (0.5 in) and then lifting it away from the system unit. Set the cover aside, out of the way.



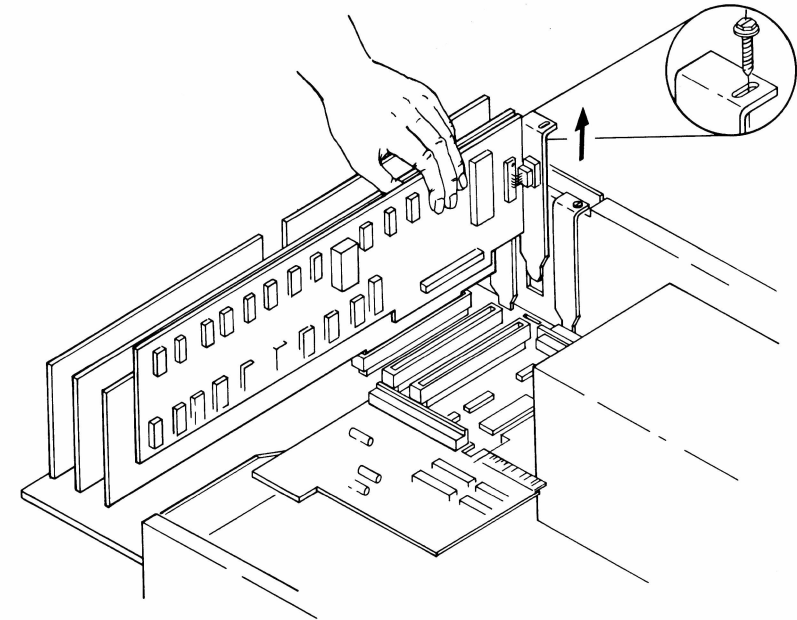
2223206-3

## Option Boards Removal

Use the following procedure to remove all of the installed option boards.

1. Note the location of the various option boards so you can reinstall them in the same location later.
2. Using a flat-bladed screwdriver or 1/4-in nutdriver, remove the screw that secures each option board plate assembly to the rear panel of the system unit. Keep these screws to use in step 6 of this procedure.
3. Refer to Chapter 3 of the appropriate option manual for instructions on how to remove the option board from the system unit board. If you are removing a Winchester controller board or other board that has cables attached to the side of the option board, gently remove the cable connectors attached to the board. Then, make a note of the connector number and identify the cable for later reinstallation.

4. Hold the option board firmly and lift it straight up and out of the socket.



2223206-7

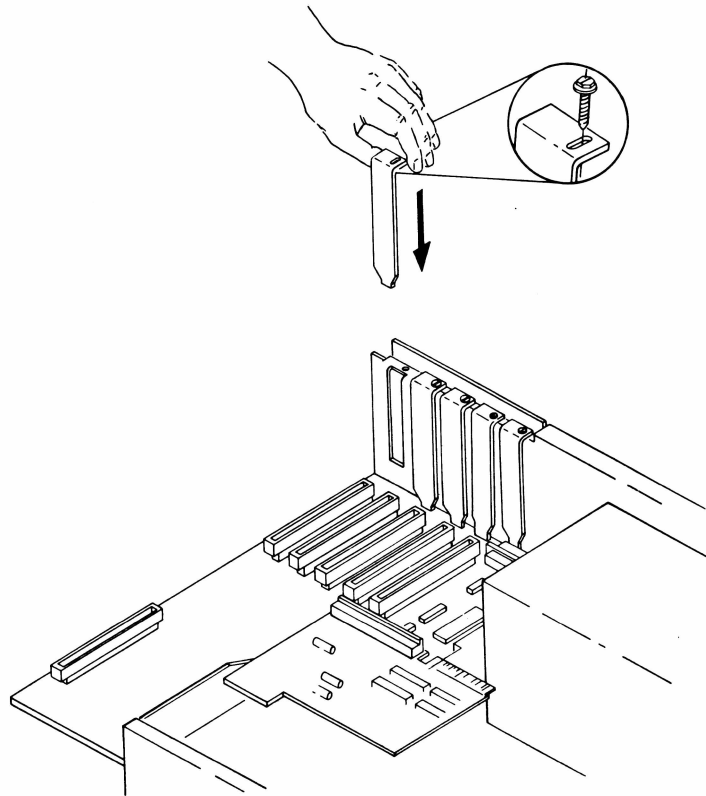
5. Place all option boards in antistatic bags. If no antistatic bags are available, wrap aluminum foil around the boards.

### NOTE

If any option board is being removed because of a fault, and a replacement board is being inserted, follow the installation instructions below or refer to Chapter 2 of the appropriate option manual. Use the antistatic bag from the replacement board to store the board being removed.



- If you are not replacing any of the option boards, place a blank plate (TI Part No. 2223033-0001) in the slot in the back of the system unit and secure it, as shown below, with the screw you removed in step 2 of this procedure.



2223206-8

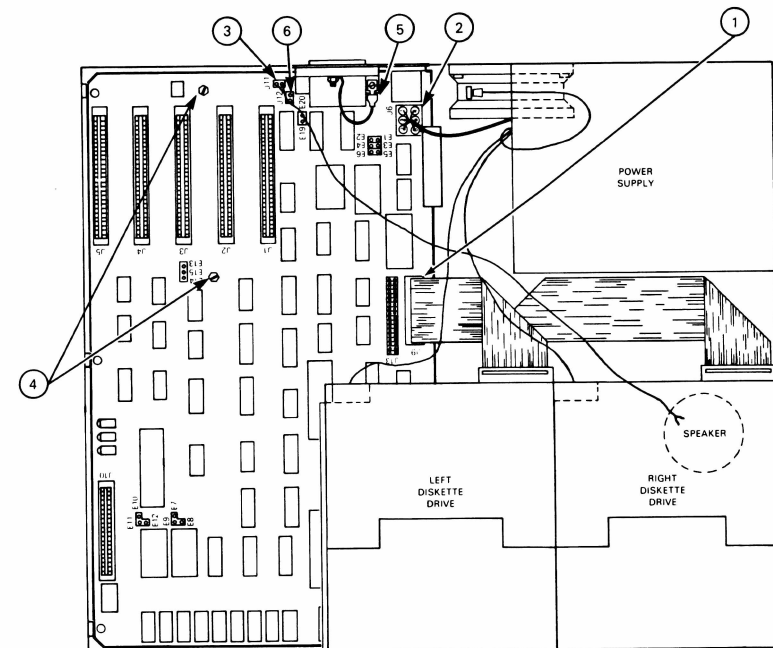
## System Unit Board Removal

Refer to the illustration on page 2-7 when removing the system unit board. The numbers in the illustration refer to the step numbers below.

Follow this procedure to remove the system unit board.

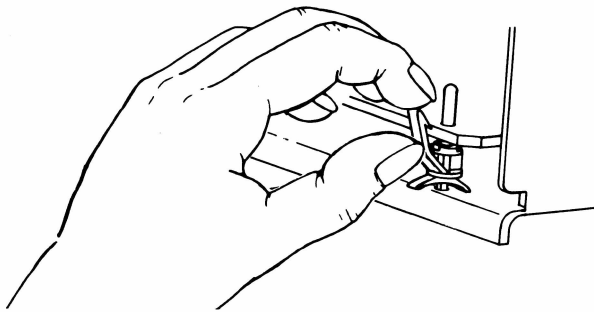
- Remove the diskette drive control/data cable connector from J9 on the system unit board.

- Remove the power supply connector from J6 on the system unit board.
- Remove the speaker connector from J11 on the system unit board.
- Remove the two 8-32 x 1/4-in sheet-metal screws securing the system unit board.
- The J7 printer connector is grounded either through a grounding cable attached to the chassis, or it is grounded through a sheet-metal screw above the J7 connector. Remove the grounding cable or the grounding screw.
- Remove the audio cable that connects the speech option board (if installed) to the J12 audio input connector on the system unit board.
- Remove any other cables attached to the system unit board. Make a note of the connectors and tag the cables.



2237397-3

8. Release the three plastic retainer clips from the side of the board.

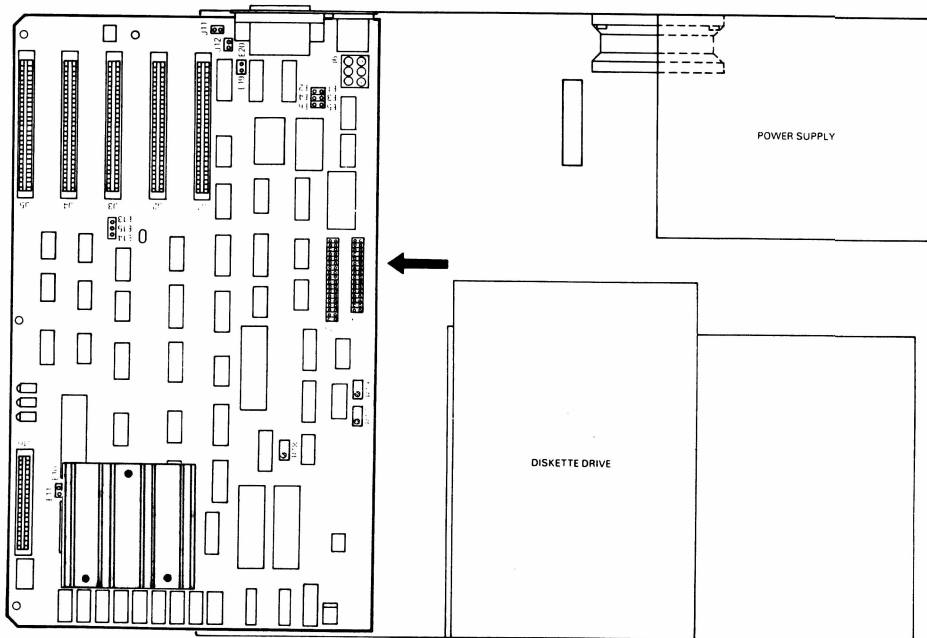


2223200-29

**NOTE**

On the Texas Instruments Portable Professional Computer, the system unit board must be lifted straight up.

9. Carefully lift the board up and out through the side of the system unit.



2237397-6

## INSTALLATION PROCEDURE

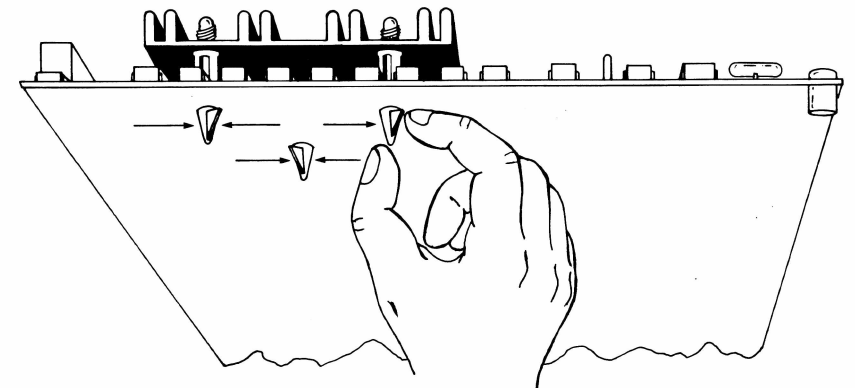
Complete the procedures described in the following sections to install the ROM upgrade option.

- Rom upgrade installation
- System unit board replacement
- Option boards replacement

### ROM Upgrade Installation

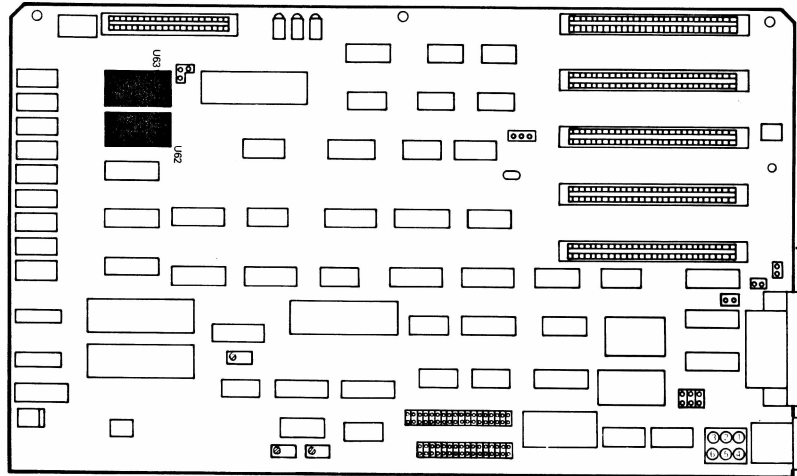
Follow this procedure to install the ROM upgrade option.

1. Locate the plastic board-guide. The plastic board-guide must be removed from the system unit board to expose the ROM device(s). Squeeze the three spacer-connectors while pulling the board-guide away from the system unit board.



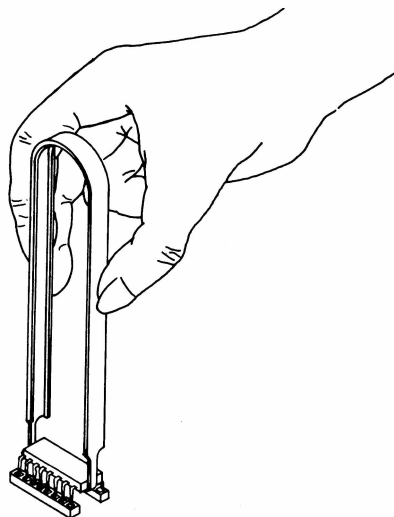
2237397-2

- Locate sockets U62 and U63. If socket U63 is occupied by a ROM device then remove the ROM device in U63. If socket U63 and socket U62 each are occupied by a ROM device, then remove the ROM device in socket U62 and socket U63.



2237397-9

Remove each device using an integrated circuit removal tool. Pull the device with a rocking motion while lifting it out of its socket.



2237397-4

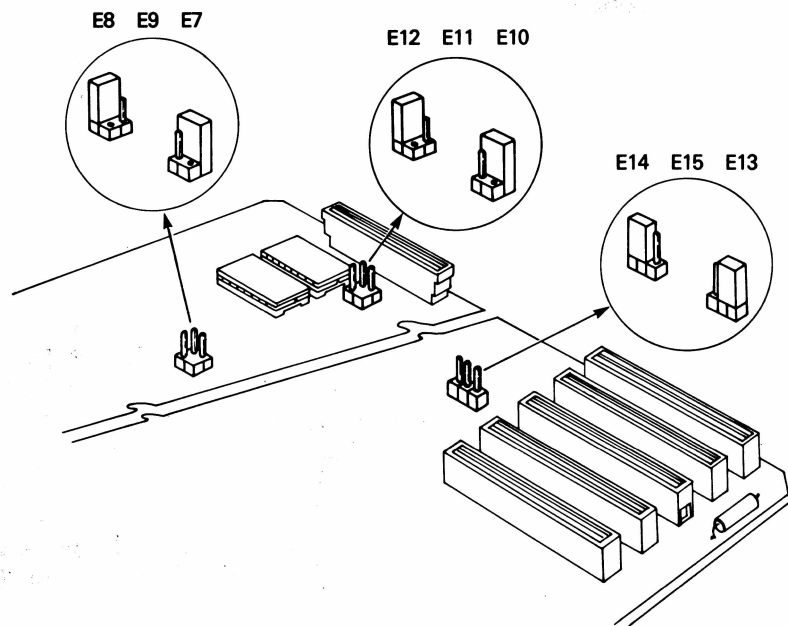
- The replacement ROM device(s) is shipped in a special antistatic container. Remove it and inspect the pins to make certain they are all aligned properly. These pins are easily bent and must be aligned with the socket connectors before you press them into place. Save the antistatic container for possible future use.
- Locate the stick-pin jumper terminals labeled E7, E8, E9, E10, E11, E12, E13, E14, and E15. If the option ROM(s) you are installing is the same type of device as the ones being replaced (that is, if you are replacing two 4K devices with two 4K devices), no change to the jumpers is necessary. If you are replacing two 4K devices with one 8K device or one 8K device with two 4K devices, the jumper configuration must be changed. Refer to the following table for the jumper configuration for the ROM upgrade option you are installing.

**NOTE**

If your option kit contains 2 ROM devices, each device is a 4K ROM. If you receive only 1 device with your kit, it is an 8K ROM.

**ROM Device(s) Jumper Configuration**

Option Type	Jumper Configuration
2 — 4K devices	E8 — E9 E14 — E15 and E11 — E12
1 — 8K device	E7 — E9 E13 — E15 and E11 — E10



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### NOTE

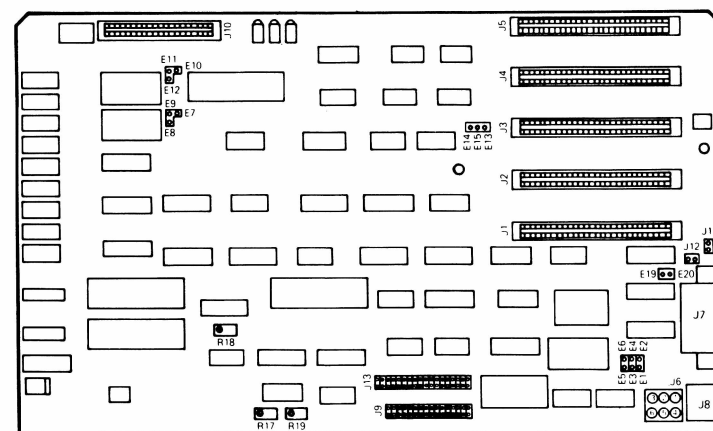
If you are replacing two 4K ROM devices with a single updated 8K ROM device, insert the replacement ROM device into socket U63. If you are replacing two 4K ROM devices with two updated 4K ROM devices, note the part numbers of each ROM device. Place the 4K ROM device with the lower of the two part numbers in socket U62. Place the other 4K ROM device in socket U63.

- Align the pins of the replacement ROM device(s) with the appropriate socket connector and firmly press the ROM device(s) into place. Position the ROM so that the notch on the device faces the rear panel of the system unit.
- Replace the board-guide by gently pressing the spacer-connectors into the three matching holes on the system unit board.

## System Unit Board Replacement

Follow this procedure to replace the system unit board.

- Ensure that all ICs, including the ROM and microprocessor, are plugged into the board. Make certain all jumpers are properly installed. The standard jumpering configuration for a system unit board is provided in the following illustration for reference purposes only. (If you did not disturb any jumpers, you do not need to refer to this.)



### JUMPER OPTIONS

- E1-E2 = Double-sided 320K bytes (Jumpered)  
Single-sided 160K bytes (No Jumper)
- E3-E4 = Reserved but currently open
- E5-E6 = 50 Hz (Jumpered)  
60 Hz (No Jumper)
- E7-E9-U62 = ROM
- E8-E9-U62 = 4K EPROM
- E10-E11-U63 = ROM
- E12-E11-U63 = 4K EPROM
- E14-E15 = 4K ROMs Decode
- E13-E15 = 8K ROMs Decode
- E19 = Signal Ground
- E20 = Chassis Ground
- No Jumper = Signal-Chassis Ground Isolated
- Jumpered = Signal-Chassis Ground Shorted

POWER CONN (J6)		
PIN NO.	SIGNAL	COLOR
1	+ 12V	Yellow
2	+ 5V	Red
3	GND	Black
4	- 12V	Green
5	+ 5V	Red
6	GND	Black

### Sound Input (J12)

- 1 = Sound In
- 2 = Ground

### Speaker Output (J11)

- 1 = Speaker
- 2 = Ground

### Potentiometers (FDC Alignment)

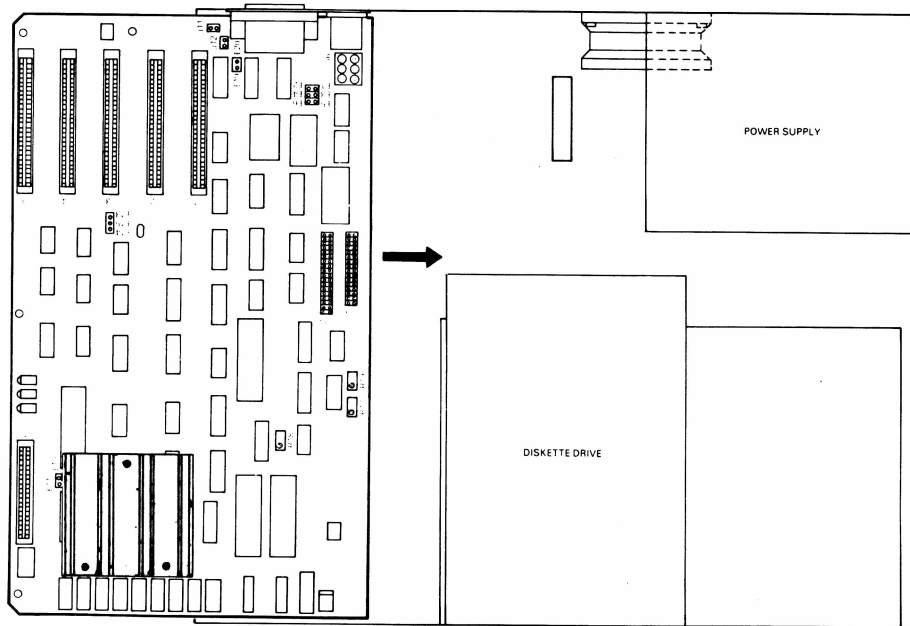
- R17 = Pump Line Voltage (1.4 Vdc)
- R18 = Vco frequency (2.0 mHz)
- R19 = Write Pulse Width (750ns)

2237397-8

2. Gently slide the board into the slots in the two locator blocks.

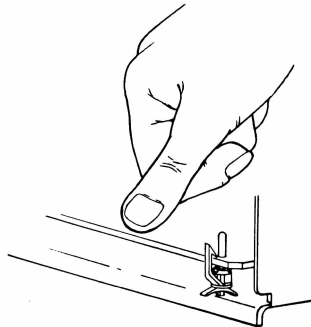
**NOTE**

On the Texas Instruments Portable Professional Computer, the system unit board must be lowered down into the chassis.



2237397-7

3. Press down on the board to secure it in the three retainer clips, as shown in the following illustration.



2223210-6

4. Install two 8-32 x 1/4-in sheet-metal screws through the holes in the center of the board and into the chassis bottom.
5. Reinstall the speaker cable connector in J11.
6. Reinstall the power supply connector in J6.
7. Reinstall the diskette drive ribbon cable connector in J9.
8. Reconnect the chassis grounding cable or the grounding screw to the J7 printer connector (if required).
9. Reinstall any other cables that were removed from the system unit board. Refer to any notes made or cables tagged.
10. Reinstall all option boards as described in the section in this chapter entitled, Option Boards Replacement. Before replacing the system unit cover, check the installation one more time; then, plug everything in for an operational check.

**CAUTION**

With the system unit cover open and power on, the system unit board and diskette drive logic boards are exposed. Make certain that no tools, test probes, or other metallic items come in contact with any exposed components. Damage to the unit can result.

## Option Boards Replacement

Follow this procedure to replace the option boards.

### NOTE

If you have any other options to install, do so now using the manual furnished with the option.

1. Refer to the option board location notes you took when you followed step 1 in the section in this chapter entitled, Option Boards Removal. Organize the option boards for reinstallation beginning with J1, the leftmost option board (as viewed from the rear), and proceeding to the right.
2. Remove the first option board to be reinstalled from its antistatic bag. Place the board on a smooth work surface, component side up. You do not need to change the configuration of any of the option boards, unless you wish to change the port number assignments of any communications or internal modem boards. Refer to Chapter 2 of the appropriate option manual for any preinstallation work necessary before installation (such as jumper configuration).

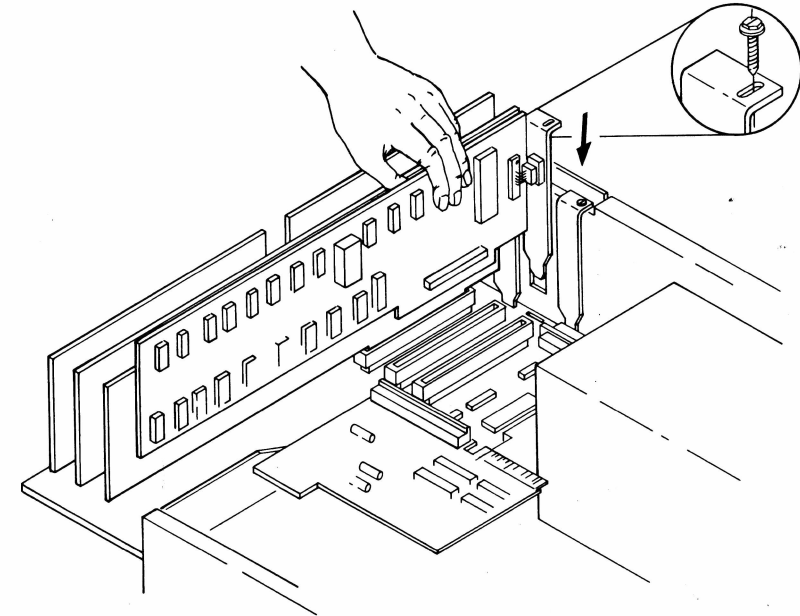
### NOTE

Although the card-edge connectors J1 to J5 are all logically and electrically identical, physical size and cabling limitations require that some boards occupy certain positions and never occupy certain other positions. The following boards must be installed in the positions indicated.

- The Winchester controller board must always be installed in position J1, because ribbon cables are attached to the side of the board facing the Winchester drive assembly.
- The synchronous-asynchronous communications board can be installed in any position. If an expansion RAM board is installed, however, Texas Instruments recommends that the synchronous-asynchronous communications board be installed

in position J5. This is because the communications board is shorter than most option boards. This leaves the remaining positions available for installing full-size option boards.

3. Locate the card-edge connector where you wish to install the option. Use the same positions the option boards occupied before you installed the ROM upgrade, if possible.
4. Gently insert the option board into the selected card-edge connector on the system unit board. Continue until all boards are reinstalled. Use the guide on the front panel and the slot on the rear of the system unit chassis to align the board during insertion.



2223206-5

5. Align the hole on the back plate of each option board with the corresponding hole on the back panel of the sytem unit. Install the screws you removed when you followed step 2 in the section in this chapter entitled, Option Board Removal. Tighten the screws using a flat-bladed screwdriver or a 1/4-in nutdriver.
6. Reinstall the audio cable leading from the speech option board (if installed) and connecting to J12 audio input connector on the system unit board.

## INSTALLATION CHECKOUT

Before replacing the system unit cover, check the installation one more time. Then, plug everything in for an operational check.

### CAUTION

With the system unit cover open and power on, the system unit board and diskette drive logic boards are exposed. Make certain that no tools, test probes, or other metallic items come in contact with any exposed components. Damage to the unit can result.

1. Reconnect the following:
  - Keyboard cable
  - Display unit signal cable
  - Display unit power cord
  - System unit power cord
2. With the system unit ON/OFF switch in the OFF position, plug the system unit power cord into an ac receptacle.
3. Place the diagnostics diskette packed with the option kit in the left drive. Close the drive door.

4. Turn the display unit brightness control fully clockwise.
5. Place the system unit ON/OFF switch in the ON position.

### NOTE

The following step applies to Texas Instruments Professional Computers that are equipped with a Winchester disk drive and controller option.

6. When the system unit is turned on, the power-up self-test is conducted. As part of the power-up self-test, the top line of the display flashes (during the CRT video test). Immediately after this flash (within one second), you must press the ESCape key. This tells the computer that you wish to boot the operating system on the diskette instead of on the Winchester disk.

When the diagnostic menu is booted up, it looks similar to this. (Your exact display may vary slightly, as revisions are made from time to time to add additional tests for new options.)

```
Texas Instruments Professional Computer DIAGNOSTICS
Version 1.60 (C) Copyright Texas Instruments, Inc. 1983
```

```
Overall Unit Test ..... Yes No
Memory Test ..... Yes No
CRT Test ..... Yes No
CRT Graphics Test ..... Yes No
Parallel Printer Test ..... Yes No
Keyboard Test ..... Yes No
Diskette Verify Test ..... Yes No
Diskette Read/Write Test ..... Yes No
Communication Port(s) Test ..... Yes No
Winchester Format/Surface Analysis Test ... Yes No
Winchester Checkout/Verify Test ..... Yes No
Display System Configuration ..... Yes No
Print Test Results ..... Yes No
```

Select appropriate test(s) and press ENTER...

7. Select the Overall Unit Test. During this test, the system configuration table appears on the display.

The following statement:

```
ROMs installed:  
V1.24 SYSROM -
```

indicates the revision label of the ROM(s) you just installed. Verify that this revision number matches the label on the front of this manual. If the revision numbers do not match, follow this procedure.

- Check the orientation of U62 and U63.
  - Look for bent pins on the ROM devices.
  - Check the part number of the ROM(s) with the part number on the cover of this manual. If the version number is greater than the version number on the label (that is, if the version number on the label is 1.24 and the version number supplied by the diagnostics is 1.25), do not worry. You merely have a more recent ROM version, and *there is no reason to change the ROM(s)*. If the version number is lower (that is, if the version number on the label is 1.24 and the version number supplied by the diagnostics is 1.23), then return the ROM upgrade kit to your Texas Instruments Authorized Dealer.
  - If you cannot resolve the problem, return the option to your Texas Instruments Authorized Dealer.
8. Place the system unit ON/OFF switch in the OFF position.

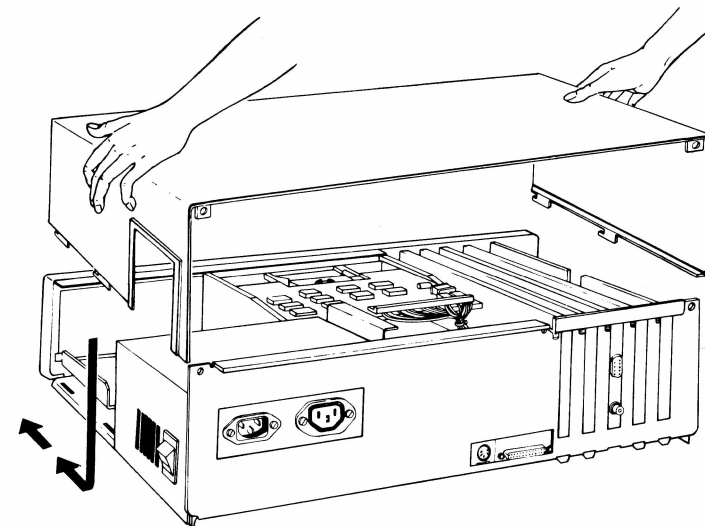
Now that the installation checkout has been completed, continue with the remaining installation steps.

9. Turn the system unit around so that the rear panel is facing you. You may find it easier if you disconnect the ac power cord and other cables from the rear of the back panel.

#### NOTE

If you have any additional options to install, do so now before you replace the system unit cover.

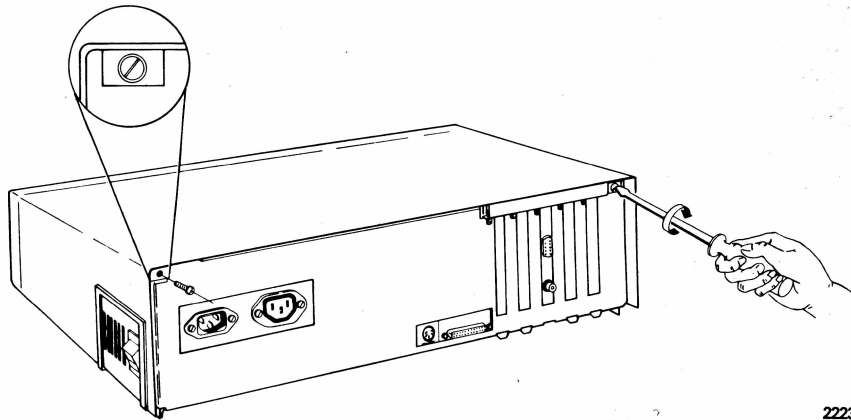
10. Replace the system unit cover by gently lowering it into place and sliding it toward the front panel, as shown in the following illustration.



2223205-8



11. Replace the two screws that secure the system unit cover and tighten them.



12. Reconnect the following:

- Keyboard cable
- Display unit signal cable
- Display unit power cord
- System unit power cord
- Any peripheral cables that you removed

You have now completed the installation and checkout of the ROM upgrade option. If more extensive testing is required, refer to your *Maintenance Handbook*.

## INSTALLATION CHECKLIST

The following is a list of all the steps necessary to install the ROM upgrade option. These steps are presented in an abbreviated form for quick reference.

1. Insert a diagnostic diskette in left drive.
2. Turn the system unit ON.
3. Perform the Overall Unit Test.
4. Turn the system unit OFF.
5. Remove the power cord from the ac receptacle.
6. Disconnect the system unit power cord.
7. Disconnect the display unit power cord.
8. Disconnect the display unit signal cable.
9. Disconnect the keyboard cable.
10. Disconnect any peripheral cables connected to the system unit.
11. Remove the display unit from the top of the system unit.
12. Remove the system unit cover.
13. Remove the screw that secures the option board to the rear panel of the system unit.
14. Remove the Winchester controller board and any attached cables.
15. Mark the detached cables for later reinstallation.
16. Lift the option board up and out of its socket.
17. Place all option boards in antistatic bags or wrap in aluminum foil.

18. Place a blank plate in any unfilled option board slots.
19. Remove diskette drive control/data cable from J9 on system unit board.
20. Remove power supply connector from J6 on system unit board.
21. Remove speaker connector from J11 on system unit board.
22. Remove the two 8-32 x 1/4-in sheet-metal screws from system unit board.
23. Remove J7 printer connector grounding cable or grounding screw.
24. Remove audio cable from J12 audio input connector on system unit board.
25. Remove any other cables attached to system unit board.
26. Release plastic retainer clips from side of board.
27. Lift system unit board up and out through side of system unit.
28. Remove plastic board guide.
29. Remove ROM devices in sockets U62 and U63.
30. Inspect replacement ROM(s) for any misaligned pins.
31. Make certain stick-pin jumper terminals (E7, E8, E9, E10, E11, E12, E13, E14 and E15) are jumpered correctly.
32. Install replacement ROM(s).
33. Replace board guide.
34. Ensure all ICs are plugged into the board.
35. Replace system unit board in system unit.

36. Secure the board in the three retainer clips.
37. Replace the two 8-32 x 1/4-in sheet-metal screws in the system unit.
38. Reinstall the speaker cable connector in J11.
39. Reinstall the power supply connector in J6.
40. Reinstall the diskette drive ribbon cable connector in J9.
41. Reconnect the chassis grounding cable or the grounding screw to the J7 printer connector.
42. Reinstall any other cables that were removed from the system unit board.
43. Reinstall all option boards.
44. Replace the Winchester controller board in position J1.
45. Replace the synchronous-asynchronous communications board in J5, if an expansion RAM board is installed.
46. Install the screws in the back plate of each option board.
47. Reinstall the audio cable leading from the speech option board and connecting to J12 audio input connector on system unit board.
48. Check installation before replacing the system unit cover.
49. Reconnect keyboard cable.
50. Reconnect display unit signal cable.
51. Reconnect display unit power cord.
52. Reconnect system unit power cord.
53. Reconnect any peripheral cables you removed.

- 
54. Plug system unit power cord into ac receptacle.
  55. Place diagnostics diskette in left drive and close drive door.
  56. Turn display unit brightness control fully clockwise.
  57. Turn system unit ON.
  58. Select Overall Unit Test.
  59. Check orientation of U62 and U63.
  60. Look for bent pins on ROM devices.
  61. Inspect part numbers of ROM(s) with cover manual part number.
  62. Turn system unit OFF.
  63. Replace system unit cover.
  64. Replace the two securing screws.

You have now completed the installation and checkout of the ROM upgrade option. If more extensive testing is required, refer to your *Maintenance Handbook*.

---

## Option Removal

---

### PRELIMINARY STEPS

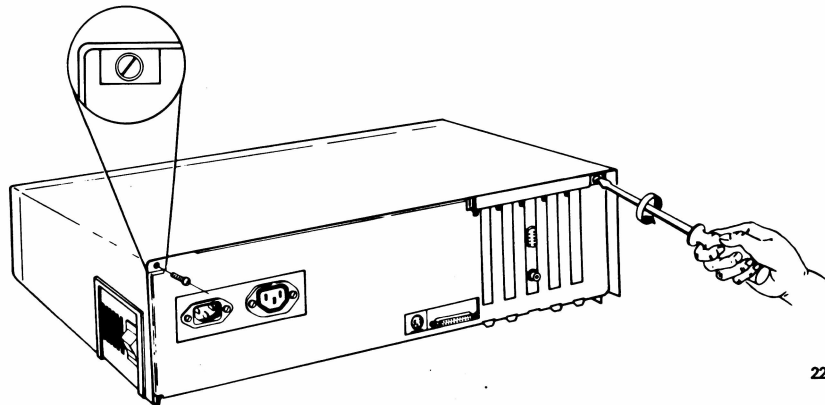
Before you remove the ROM upgrade option, complete the following steps.

#### NOTE

If your computer is a Texas Instruments Portable Professional Computer, refer to the Texas Instruments Portable Professional Computer operating instructions (TI Part No. 2238689-0001) for system unit disassembly and board removal instructions.

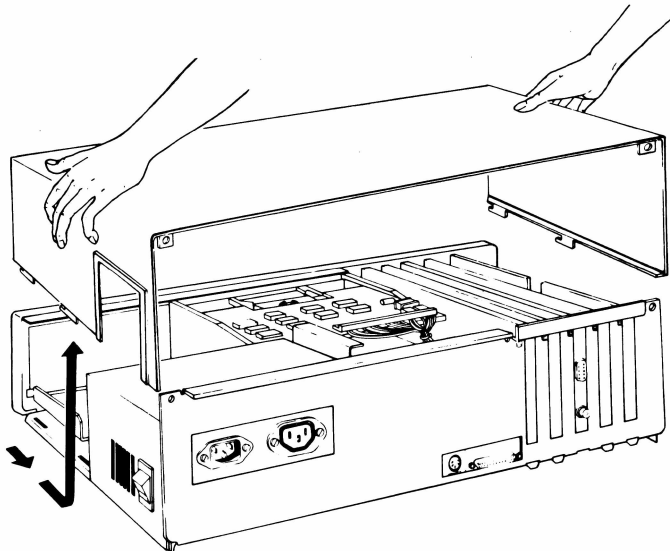
1. If you wish to check the computer or option before removing the option, refer to your *Operating Instructions* for checkout procedures using a diagnostics diskette, version 1.50 or a later version (a version number greater than 1.50).
2. Place the system unit ON/OFF switch in the OFF position and remove the system unit power cord from the ac receptacle.
3. Disconnect the following:
  - System unit power cord
  - Display unit signal cable
  - Display unit power cord
  - Keyboard cable
  - Any other peripheral cables connected to the system unit
4. Remove the display unit from the top of the system unit and set it to the side. Set the keyboard and any other peripherals to the side, away from the system unit.

5. Turn the system unit so that the back panel is facing you. Remove one screw from each top corner using a flat-bladed screwdriver. Refer to the following illustration for the locations of the screws.



2223206-2

6. Remove the system unit cover by pulling it back approximately 13 mm (1/2 in), and then lifting it away from the system unit. Set the cover aside, out of the way.



2223206-3

## REMOVAL PROCEDURES

To remove the ROM upgrade option, complete the procedures described in the following sections of this chapter.

- Option boards removal
- System unit board removal
- ROM device removal

### Option Boards Removal

Use the following procedure to remove all of the installed option boards.

#### CAUTION

Static electricity can be destructive to static-sensitive components mounted on the option board. Before you touch or remove any of the printed wiring boards, be sure you are discharged of static electricity. Do this by momentarily touching any grounded object or a metal-framed desk or table.

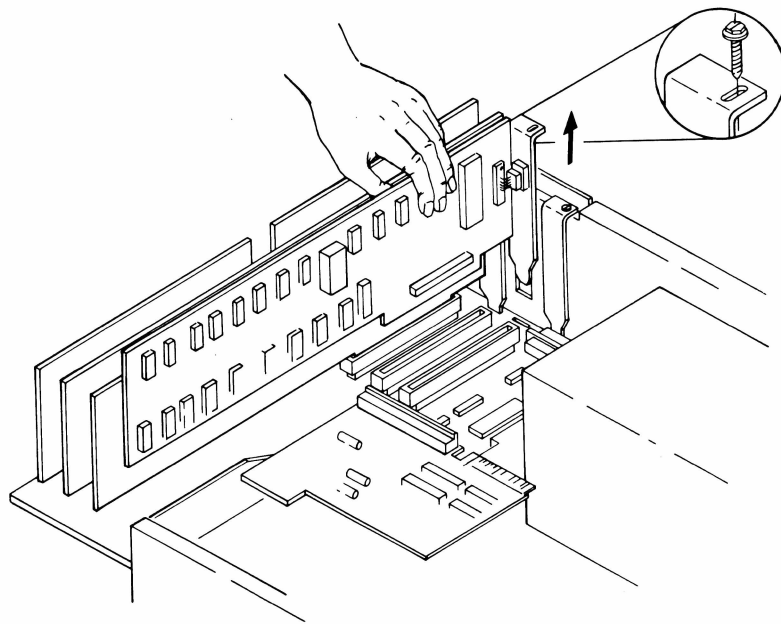
1. Note the location of the various option boards so that you can reinstall them in the same location later.
2. Using a flat-bladed screwdriver or 1/4-in nutdriver, remove the screw that secures the option board plate assembly to the rear panel of the system unit. Keep these screws to use in step 6 of this procedure.
3. Refer to Chapter 3 of the appropriate option manual for instructions on how to remove the option board from the system unit board. If you are removing a Winchester controller board or other board that has cables attached to the side of the option board, gently remove the cable connectors attached to the board.
4. Hold the option board firmly and lift it straight up and out of the socket.

5. Place each option board in an antistatic bag. If no antistatic bags are available, wrap aluminum foil around each board.

#### NOTE

If any option board is being removed because of a fault, and a replacement board is being inserted, follow the installation instructions below or refer to Chapter 2 of the appropriate option manual. Use the antistatic bag from the replacement board to store the board being removed.

6. If you are not replacing any one of the option boards, place a blank plate (TI Part No. 2223033-0001) in the slot in the back of the system unit and secure it with the screw removed in step 2 of this procedure.

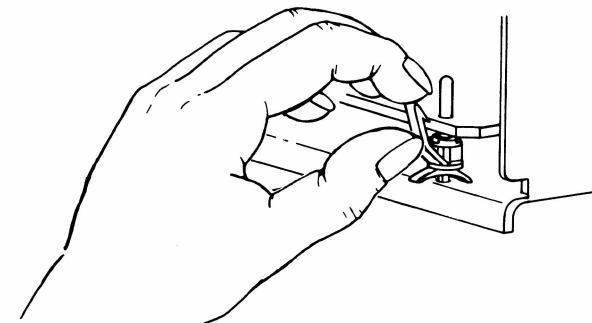


2223206-7

## System Unit Board Removal

Follow this procedure to remove the system unit board.

1. Remove the diskette drive control/data cable connector from J9 on the system unit board.
2. Remove the power supply connector from J6 on the system unit board.
3. Remove the speaker connector from J11 on the system unit board.
4. Remove the two 8-32 x 1/4-in sheet-metal screws that secure the board.
5. If the J7 printer connector is grounded with a grounding cable or with a sheet-metal screw above the J7 connector, remove the grounding cable or the grounding screw.
6. Remove the audio cable that leads from the speech option board (if installed) and connects to J12 audio input connector on the system unit board.
7. Remove any other cables attached to the system unit board, after first tagging the cable of the specific connector to which it was attached. This is so you can later identify the connector to which it attaches.
8. Release the three plastic retainer clips from the side of the board.

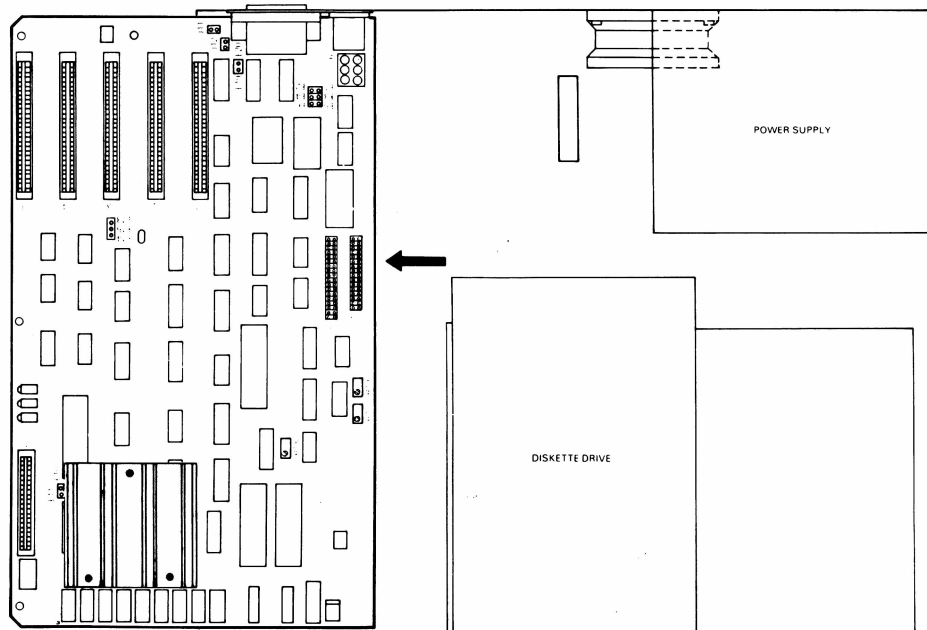


2223200-29

- Carefully lift the board up and out through the side of the system unit, as shown in the following illustration.

**NOTE**

On the Texas Instruments Portable Professional Computer, the system unit board must be lifted straight up.

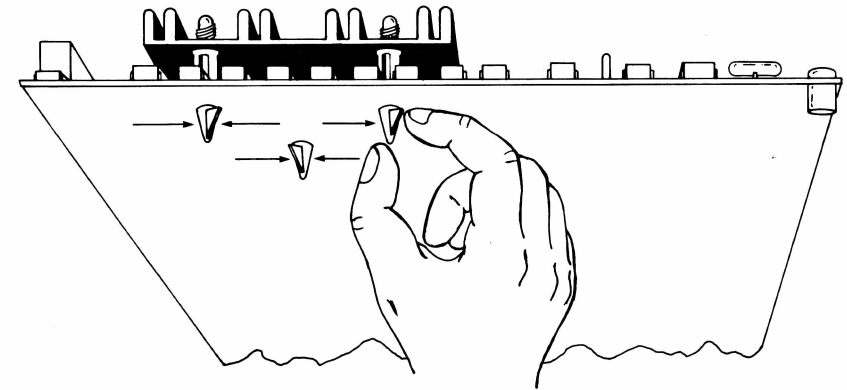


2237397-6

## ROM Device Removal

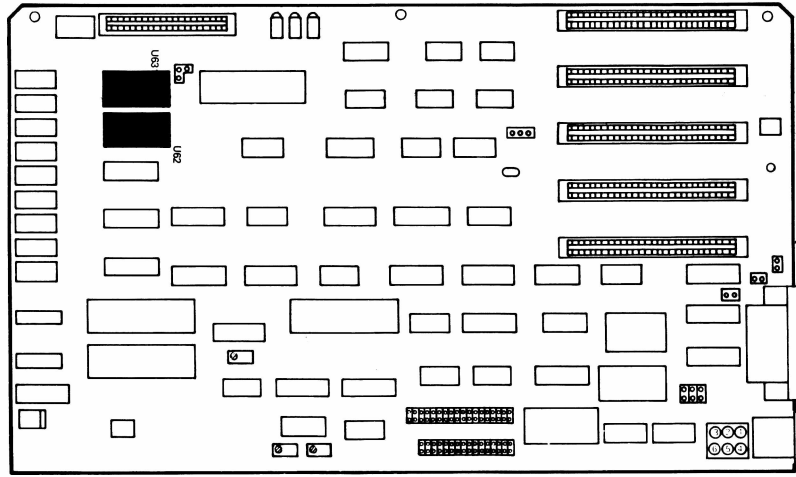
Follow this procedure to remove the ROM upgrade option.

- Locate the plastic board-guide. The plastic board-guide must be removed from the system unit board in order to expose the ROM device(s). Squeeze the three spacer-connectors while pulling the board-guide away from the system unit board.



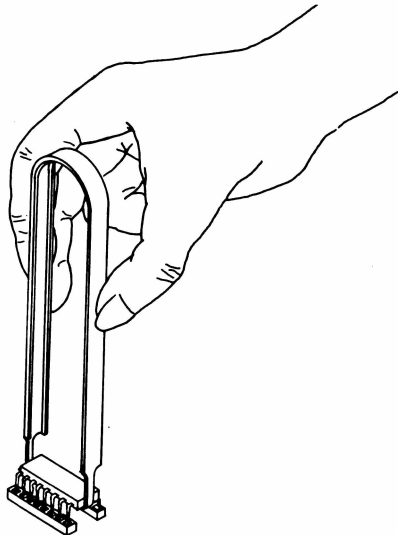
2237397-2

2. Locate sockets U62 and U63. If socket U63 is occupied by a ROM device, then remove the ROM device in U63. If socket U63 and socket U62 each are occupied by a ROM device, then remove the ROM device in socket U63 and socket U62.



2237397-9

Remove each device using an integrated circuit removal tool. Pull the device with a rocking motion while lifting it out of its socket.



2237397-4

3. If the ROM device(s) is being removed because of a fault, and a replacement ROM device(s) is being inserted, complete the following steps:

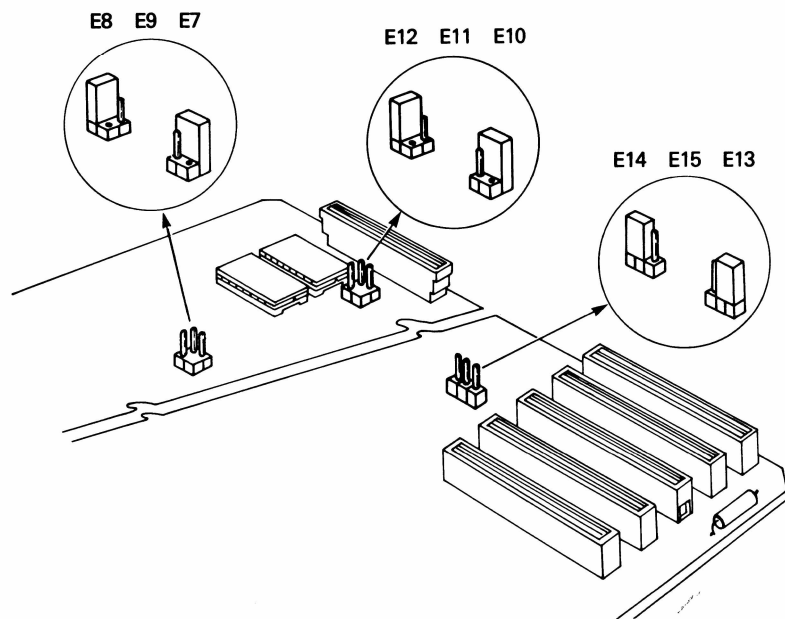
- Remove the replacement ROM device(s) from the special anti-static container. Inspect the pins to make certain they are all aligned properly. These pins are easily bent and must be aligned with the socket connectors before you press them into place. Save the antistatic container for possible future use.
- Locate the stick-pin jumper terminals labeled E7, E8, E9, E10, E11, E12, E13, E14, and E15. If the option ROM(s) you are installing is the same type of device as the one being replaced (that is, if you are replacing two 4K devices with two 4K devices), no change to the jumpers is necessary. If you are replacing two 4K devices with one 8K device, or one 8K device with two 4K devices, the jumper configuration must be changed. Refer to the following table for the jumper configuration for the ROM upgrade option you are installing.

#### NOTE

If your option kit contains two ROM devices, each device is a 4K ROM. If you receive only 1 device with your kit, it is an 8K ROM.

#### ROM Device(s) Jumper Configuration

Option Type	Jumper Configuration
2 — 4K devices	E8 — E9 E14 — E15 and E11 — E12
1 — 8K device	E7 — E9 E13 — E15 and E11 — E10



2237397-5

#### NOTE

If you are replacing two 4K ROM devices with a single updated 8K ROM device, insert the replacement ROM device into socket U63. If you are replacing two 4K ROM devices with two updated 4K ROM devices, note the part numbers associated with each ROM device. Place the 4K ROM device with the lower of the two part numbers in socket U62. Place the remaining 4K ROM device in socket U63.

- Align the pins of the replacement ROM device(s) with the appropriate socket connector and firmly press the ROM device(s) into place. Position the ROM so that the notch on the device faces the rear panel of the system unit.
- Replace the board guide by gently pressing the spacer-connectors into the three matching holes on the system unit board.

## REPLACEMENT PROCEDURE

After removing the ROM upgrade option, complete the procedures described in the following sections of this chapter.

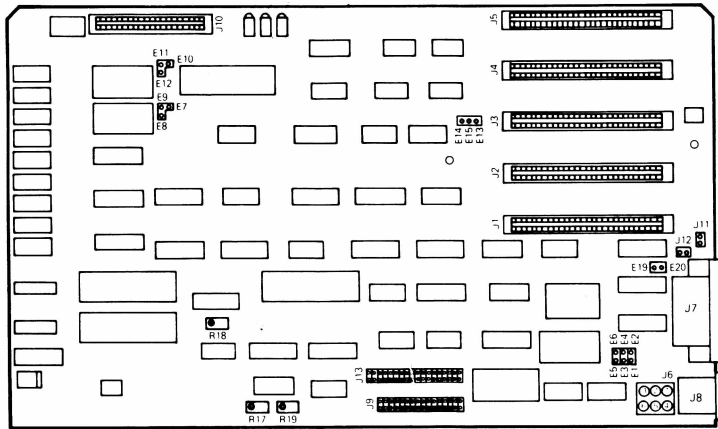
- System unit board replacement
- Option boards replacement
- System unit reconnection



## System Unit Board Replacement

Follow this procedure to replace the system board.

1. Ensure that all ICs, including the ROM and microprocessor, are plugged into the board. Make certain all jumpers are properly installed. The standard jumper configuration for a system unit board is provided in the following illustration for reference purposes only. (If you did not disturb any jumpers, you do not need to refer to this.)



### JUMPER OPTIONS

E1-E2	- Double-sided 320K bytes (Jumpered) Single-sided 160K bytes (No Jumper)
E3-E4	- Reserved but currently open
E5-E6	= 50 Hz (Jumpered) 60 Hz (No Jumper)
E7-E9-U62	- ROM
E8-E9-U62	= 4K EPROM
E10-E11-U63	- ROM
E12-E11-U63	= 4K EPROM
E14-E15	- 4K ROMs Decode
E13-E15	- 8K ROMs Decode
E19	- Signal Ground
E20	= Chassis Ground
No Jumper	= Signal-Chassis Ground Isolated
Jumpered	= Signal-Chassis Ground Shorted

POWER CONN (J6)		
PIN NO.	SIGNAL	COLOR
1	+12V	Yellow
2	+5V	Red
3	GND	Black
4	-12V	Green
5	+5V	Red
6	GND	Black

### Sound Input (J12)

- 1 - Sound In
- 2 - Ground

### Speaker Output (J11)

- 1 - Speaker
- 2 - Ground

### Potentiometers (FDC Alightment)

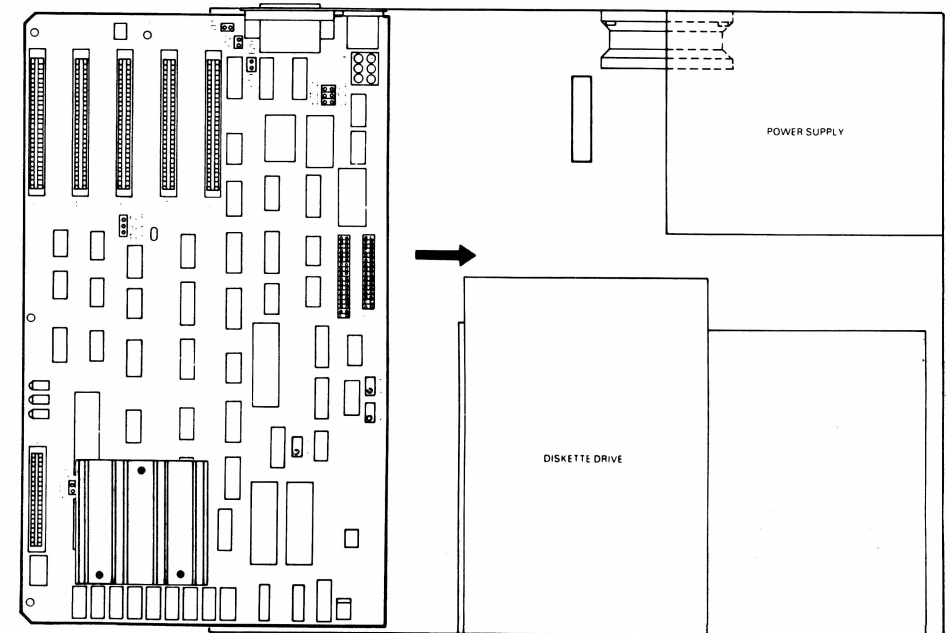
- R17 = Pump Line Voltage (1.4 Vdc)
- R18 = Vco frequency (2.0 mHz)
- R19 = Write Pulse Width (750ns)

2237397-8

2. Gently slide the board into the slots in the two locator blocks.

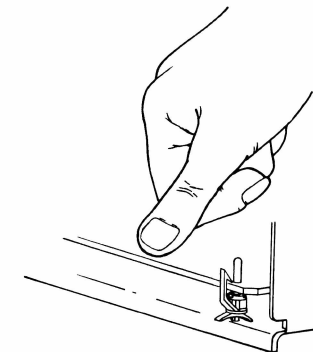
### NOTE

On the Texas Instruments Portable Professional Computer, the system unit board must be lowered into the chassis.



2237397-7

3. Press the board down to secure it in the three retainer clips, as shown in the following illustration.



2223210-6

- 
4. Install two 8-32 x 1/4-in sheet-metal screws through the holes in the board and into the chassis bottom.
  5. Reconnect the speaker cable connector to J11.
  6. Reconnect the power supply connector to J6.
  7. Reconnect the diskette drive ribbon cable connector to J9.
  8. Reconnect the external diskette drive cable (if installed) to J13.
  9. Reconnect the grounding cable or the grounding screw to the J7 printer connector.
  10. Reconnect the audio cable leading from the speech option board (if installed) to the J12 audio input connector on the system unit board.
  11. Before replacing the system unit cover, connect the cables and conduct an operational check.

#### CAUTION

With the system unit cover open and power applied, the system unit board and diskette drive logic boards are exposed. Make certain that no tools, test probes, or other metallic items come in contact with any exposed components. Damage to the unit can result.

### Option Boards Replacement

Reinstall all option boards that were removed from the system unit, using procedures in Chapter 2 entitled Option Boards Replacement.

If you have any other options to install, do so now, using the manual furnished with the option.

### System Unit Reconnection

To reconnect the system unit, follow the procedure in the section in Chapter 2 entitled Installation Checkout.

## Theory of Operation

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### READ-ONLY MEMORY

ROM (read-only memory) is the reserved portion of main memory that is read from but not written to. ROMs can be written only once and cannot be changed later. ROMs are used to store programs that the CPU must read but does not need to change.

### READ-ONLY MEMORY UPGRADE

Occasionally, Texas Instruments introduces new options that require firmware changes. The ROM upgrade kit allows you to conveniently update the firmware in the Texas Instruments Professional Computer system ROMs to the latest revision.

## Troubleshooting

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### ACTIVATING THE DIAGNOSTICS

Follow this procedure to access the Advanced Diagnostics menu.

1. Place the system unit ON/OFF switch in the OFF position.
2. Place the diagnostics diskette packed with the option kit in the left drive. Close the drive door.
3. Turn the display unit brightness control fully clockwise.
4. Place the system unit ON/OFF switch in the ON position.

#### NOTE

The following step applies to Texas Instruments Professional Computers that are equipped with a Winchester disk drive and controller option.

5. When the system unit is turned on, the power-up self-test is conducted. As part of the power-up self-test, the top line of the display flashes (during the CRT video test). Immediately after this flash (within one second), you must press the ESCape key. This tells the computer that you wish to boot the operating system on the diskette, instead of the operating system on the Winchester disk.

When the diagnostic menu is booted up, it looks similar to this. (Your exact display may vary slightly, as revisions are made from time to time to add additional tests for new options.)

```
Texas Instruments Professional Computer DIAGNOSTICS
Version 1.60 (C) Copyright Texas Instruments, Inc. 1983
```

Overall Unit Test .....	Yes	No
Memory Test .....	Yes	No
CRT Test .....	Yes	No
CRT Graphics Test .....	Yes	No
Parallel Printer Test .....	Yes	No
Keyboard Test .....	Yes	No
Diskette Verify Test .....	Yes	No
Diskette Read/Write Test .....	Yes	No
Communication Port(s) Test .....	Yes	No
Winchester Format/Surface Analysis Test ...	Yes	No
Winchester Checkout/Verify Test .....	Yes	No
Display System Configuration .....	Yes	No
Print Test Results .....	Yes	No

Select appropriate test(s) and press ENTER...

- To access the Advanced Diagnostics menu, press and hold the CTRL key and the A key while the user diagnostics menu is being displayed. Your display then shows the Advanced Diagnostics menu, similar to the following.

```
Texas Instruments Professional Computer
Advanced Diagnostics
KEYBOARD  entry of diagnostics
BATCH     execution of diagnostics
FACTORY   diagnostics interface
```

Select mode and press ENTER...

Press ESC to return to main menu...

- Select the KEYBOARD mode. The following display appears.

```
COMMAND: _____
```

Press ESC to return to advanced menu...

- Enter the ROMTST command as described in the following paragraphs.

### ROMTST COMMAND

The ROMTST command performs a cyclic redundancy check (CRC) test that reports a pass/fail status on each ROM installed. The size of the ROM, along with its CRC checksum, is displayed with the completion or error message.

---

## ROMTST Command Syntax

The following is a guide to the correct syntax of the ROMTST command.

### Syntax:

Command	Parameter	Description	Acceptable Value	Default Value
ROMTST	ERRors	Number of errors reported.	1 to 255	1
	LOG	Enables logging of messages to printer.	ON,OFF	OFF
	LOOps	Number of test repetitions.	1 to 9999	1

### Example of ROMTST command:

```
ROMTST LOG=ON LOO=9999
```

In this example, the ROM CRC test is repeated 9999 times and any messages are logged to the printer.

---

## ERROR MESSAGES

The following messages can appear at power-up time or at the completion of the ROM CRC test (ROMTST). The following list shows the error messages, the cause of the errors, and the solutions, if any.

### Power-Up Error Messages

**\*\*System Error-0028\*\***

Option ROM at hexadecimal address 0F4000 failed.

**\*\*System Error-0029\*\***

Option ROM at hexadecimal address 0F6000 failed.

**\*\*System Error-002A\*\***

Winchester Option ROM at hexadecimal address 0F8000 failed.

**\*\*System Error-002B\*\***

Option ROM at hexadecimal address 0FA000 failed.

**\*\*System Error-002C\*\***

System ROM (U62) at hexadecimal address 0FC000 failed.

**\*\*System Error-002D\*\***

System ROM (U63) at hexadecimal address 0FE000 failed.

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## Advanced Diagnostic Error Messages

ROM test: Test complete - 0400

The ROM CRC test (ROMTST) completed successfully. No corrective action required.

ROM test: Test aborted - 0401

The ROM CRC test (ROMTST) aborted unsuccessfully. No corrective action required.

ROM test:Loop xxxx: CRC error-0402 (ROM at hexadecimal address 0F4000 failure)

This option ROM reserved for future use.

ROM test:Loop xxxx: CRC error-0403 (ROM at hexadecimal address 0F6000 failure)

This option ROM reserved for future use.

ROM test:Loop xxxx: CRC error-0404 (ROM at hexadecimal address 0F8000 failure)  
(Winchester board ROM)

The Winchester board controller ROM failed. Replace Winchester controller board.

ROM test:Loop xxxx: CRC error-0405 (ROM at hexadecimal address 0FA000 failure)

This option ROM reserved for future use.

ROM test:Loop xxxx: CRC error-0406 (ROM at hexadecimal address 0FC000 failure [U62])

System ROM U62 failed. Replace system unit board.

ROM test:Loop xxxx: CRC error-0407 (ROM at hexadecimal address 0FE000 failure [U63])

System ROM U63 failed. Replace system unit board.

Customer service and warranty information is applicable only in the United States and Canada. Please refer to the local customer service and warranty information where applicable.

## **THREE-MONTH LIMITED WARRANTY TEXAS INSTRUMENTS PROFESSIONAL COMPUTER**

THIS TEXAS INSTRUMENTS PROFESSIONAL COMPUTER WARRANTY EXTENDS ONLY TO THE ORIGINAL PURCHASER OF THIS PRODUCT ("PURCHASER") WHO QUALIFIES AS A CONSUMER.

### **WARRANTY DURATION**

Texas Instruments Incorporated warrants this Computer for a period of three (3) months from the date of original purchase by the Purchaser.

### **WARRANTY COVERAGE**

This Computer is warranted against defective materials or workmanship. Expendable items such as fuses, light bulbs, etc. are not warranted. THIS WARRANTY IS VOID IF THE PRODUCT HAS BEEN DAMAGED BY ACCIDENT, UNREASONABLE USE, NEGLIGENCE, IMPROPER SERVICE OR OTHER CAUSES NOT ARISING OUT OF DEFECTS IN MATERIALS OR WORKMANSHIP.

### **PERFORMANCE BY TI UNDER WARRANTY**

During the three-month warranty period, the Computer will be repaired or replaced with a new or reconditioned product of the same or equivalent model (at TI's option) when the Computer is returned either in person or by prepaid shipment to an authorized Texas Instruments Computer Dealer or TI Service Center with a copy of the purchase receipt. Please first contact the Dealer from whom you purchased the Computer to determine the exchange policy of the Dealer.

Texas Instruments strongly recommends that you insure the Computer for value prior to shipment.

The repaired or replacement Computer will be warranted for three months from date of repair or replacement. Other than the postage requirement (where allowed by state law), no charge will be made for the repair or replacement of an in-warranty Computer.

### **WARRANTY AND CONSEQUENTIAL DAMAGES DISCLAIMERS**

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Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

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## LEGAL REMEDIES

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

## TEXAS INSTRUMENTS SERVICE FACILITIES

### U.S. Residents:

Texas Instruments Incorporated  
DSG Service Facility  
P.O. Box 1444, MS 7758  
Houston, Texas 77251  
(512) 250-6000

### Canadian Residents:

Geophysical Services Incorporated  
41 Shelley Road  
Richmond Hill, Ontario  
Canada L4C 5G4  
(416) 884-9181

Purchasers in California and Oregon may contact the following Texas Instruments offices for additional assistance or information.

### California

Texas Instruments Incorporated  
DSG Service Facility  
831 South Douglas St., Suite 119  
El Segundo, California 90245  
(213) 973-2571

### Oregon

Texas Instruments Incorporated  
DSG Service Facility  
6700 Southwest 105th  
Kristin Square Suite 110  
Beaverton, Oregon 97005  
(503) 643-6758

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